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Author(s): Gasda, Patrick J.

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## Tech Snapshot Space

Published: May 11, 2021

### ORGANICAM

*First camera for noncontact,  
nondestructive biodetection in remote  
environments and space*



#### SUMMARY

Researchers at Los Alamos have developed OrganiCam, a compact, lightweight laser-induced fluorescence imaging camera and a Raman spectrometer for Mars caves, icy-moon and asteroid surface exploration, and terrestrial sterile laboratory use. It was designed to make remote observations in extreme environments to identify organic molecules and the biosignatures of life. OrganiCam is a bold step in a new direction—space missions need an imager that can “see” (observe and positively identify) organic molecules and potential biosignatures and direct the arm to sample the most promising locations. This ability to clearly see and characterize organic materials is exactly what OrganiCam does. We are seeking a commercialization partner to license the technology or participate in a Cooperative Research and Development Agreement (CRADA) to develop the technology into a commercial ready product for terrestrial applications.



#### MARKET APPLICATION

OrganiCam is applicable wherever organic molecules are rare, such as on the icy surfaces of Europa or Enceladus, or in a cave on Mars. Other applications for OrganiCam in space are ensuring that instruments sent into space do not harbor organic materials that could contaminate Mars or other parts of the solar system, and evaluating material brought back from Mars and other parts of the solar system for biosignatures of life or hazards. OrganiCam would also be useful in sterile or nearly sterile environments here on Earth, such as cleanrooms or medical facilities, where the detection and identification of organic contaminants are important.

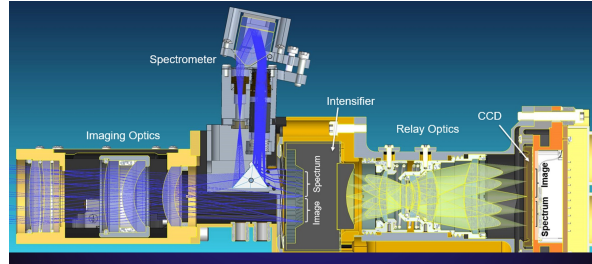
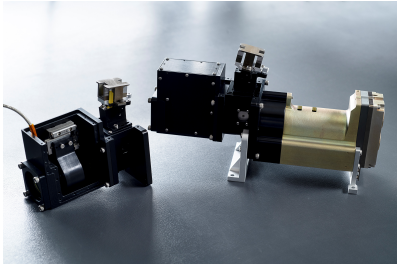
#### BENEFITS

OrganiCam is superior to the previous generations of robotic instrumentation that Los Alamos National Laboratory has built for space exploration because of its unique capabilities:

- Compact, lightweight, and robust
- Simple remote operation with low energy consumption
- Both wide-area imaging and sensitive beam modes
- Organic material identification and discrimination from surrounding matrix
- Robust camera optics for high radiation levels and the extreme cold of space

#### CONTACT

Michael Everhart - Erickson  
[michaele@lanl.gov](mailto:michaele@lanl.gov)  
505-667-8087



## WHY WE ARE BUILDING ORGanicAM

OrganiCam opens exciting frontiers in space exploration and the search for signs of life beyond the Earth. OrganiCam will be a reconnaissance instrument for organics on other bodies of the solar system. These include ocean worlds, caves on Mars, and comet surfaces. A lightweight, portable payload is radiation-hardened and robust for space applications. It can survey broad areas. OrganiCam can determine if instruments being sent into space are sterile--not contaminated with Earth's biological materials on future NASA missions, and to analyze examples returned to Earth. Beyond its use in space exploration, OrganiCam can detect organics at the parts per billion (ppb) level in "clean" environments.



## WHAT'S BEHIND OUR TECHNOLOGY

OrganiCam takes advantage of the short lifetime of biofluorescent materials to obtain real-time fluorescence images that show the locations of biological materials among luminescent minerals in a geological context. The instrument's advantages of robust operation in extreme environments, portability, simple operation, and low power requirement build on the Laboratory's expertise developed from over 50 years in designing robotic instruments for space applications.



## OUR COMPETITIVE ADVANTAGES

OrganiCam is the first-of-its-kind prototype space instrument for laser-induced fluorescence imaging to detect organics, and discriminate them from mineral fluorescence. The addition of a Raman spectrometer in the same compact package makes the instrument even more robust. For a lander on an outer solar-system body, it can image laser-illuminated organic materials within the work zone and around the lander using time-resolved fluorescence, and then identify these materials with Raman and fluorescence spectroscopy. Mounted on an aerial vehicle, it provides laser-illuminated images highlighting organic materials in a Mars cave or elsewhere, from a distance of several meters above the surface.



## OUR TECHNOLOGY STATUS

This technology was developed for use in space exploration. LANL researchers are interested in further developing the technology for applications to address other potential market needs. We are seeking a commercialization partner to license the technology or participate in a Cooperative Research and Development Agreement (CRADA) to develop the technology into a commercial ready product for terrestrial applications.



## PUBLICATIONS AND IP

United States Patent Application Number 17/118416, titled "A Single Detector Laser-Induced Fluorescence Imager and Raman Spectral Instrument", Patrick Gasda, filed December 10th, 2019.

"Standoff Biofinder" for Fast, Noncontact, Nondestructive, Large-Area Detection of Biological Materials for Planetary Exploration."

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"The SuperCam Remote Sensing Instrument Suite for the Mars 2020 Rover: A Preview." Roger C. Wiens, Sylvestre Maurice, and Fernando Rull Perez, *Spectroscopy*. May 2017. <http://www.spectroscopyonline.com/supercam-remote-sensing-instrument-suite-mars-2020-roverpreview>

Gasda, P., Wiens, R., Reyes Newell, A., Ganguly, K., Newell, R., Peterson, C., et al. (2021). OrganiCam: a lightweight time-resolved laser-induced luminescence imager and Raman spectrometer for planetary organic material characterization. *Applied Optics*. <https://doi.org/10.1364/AO.421291>